Titre de l’exposé : Atmospheric re-entry calibration using a hierarchical generative model

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Abstract—Predicting the aerodynamic evolution of a hypersonic aircraft during atmospheric re-entry is a challenging task. It can be performed using highly complex multi-physics codes. Nonetheless, in order to overcome model discrepancy, a calibration step is necessary. It is made difficult by the few available full-scale experiments. Bayesian modeling, and Gaussian processes in particular, provide a well-suited framework to address this generic issue. In the considered setting, it is further complicated because experimental data is often missing due to re-entry blackouts caused by plasma flows around the vehicle. We propose a no-imputation approach which consists in learning the posterior distribution of the model error. A non-stationary hierarchical Bayesian model is developed to accommodate scarce and incomplete data. Since the posterior law of the model parameters is high-dimensional and smooth, it is simulated thanks to the No U-Turn sampler, an adaptive variant of the Hamiltonian Monte Carlo method. Experiments illustrate the relevance of the resulting hierarchical generative model.